
Chapter Three

STORM WATER RUNOFF

Summary of Findings

1. *The existing water quality management framework is focused primarily on point source regulation, so the involved agencies are still adjusting to a new, expanded, and more complex management role.*
2. *The greatest concern surrounding the NPDES storm water program is whether the management agencies are prepared for the administrative burden they will face.*
3. *The complexity of the NPDES storm water program is being compounded by the degree of uncertainty surrounding various aspects of the program.*
4. *There is concern that the management agencies do not have adequate data on nonpoint source pollution -- or on how certain activities contribute to runoff contamination -- to undertake effective regulation.*
5. *The Texas Water Commission's Municipal Water Pollution Control and Abatement Program is expected to bring important benefits in the area of nonpoint source pollution, but the agency still has not resolved what the program will require of Texas cities.*

The U.S. Environmental Protection Agency is still in the early stages of implementing its storm water permitting rules as mandated by the Water Quality Act of 1987. Local governments are scrambling to adjust to this new water quality management framework. EPA recently moved back its group application deadlines, reportedly at the request of a number of U.S. senators who were concerned that affected governments and industries in their states needed more time to determine their status under the new rules, possibly organize groups, and prepare their NPDES (National Pollutant Discharge Elimination System) applications. The current rules focus primarily on the procedures for obtaining an NPDES permit, so there is still much to be learned about how local management programs will operate once permits are issued.

Many cities and counties have existing laws which prohibit non-permitted discharges or dumping of waste into water bodies, storm sewers, drainage channels and similar facilities. But under the NPDES permitting program, EPA is calling for much more elaborate local management strategies that will draw many more elements of urban society into the task of *preventing* storm water pollution rather than responding to it. It is the complexity and expected cost of this mandate that worries local government officials and staff. Some also worry that the demands of storm water management will divert resources and attention away from established point source programs, which will always be an essential part of water quality management. The local strategies that emerge probably will emphasize voluntary compliance through "non-structural" techniques, such as educational programs and promotion of Best Management Practices. However, some degree of regulation also is likely. Nonpoint source specialists have long advised that fundamental changes in individual "polluting behavior" would be necessary to make significant progress toward improved urban water quality.

Several of the largest governments in Harris County have organized a task force of key personnel to guide their jurisdictions through the permitting process. Harris County and the cities of Houston and Pasadena are studying their options under the NPDES program, and it appears that at least the county and the City of Houston will join together in a group application. Because Pasadena and Houston account for a large portion of its watershed, Armand Bayou will be among the first areas in the nation where NPDES storm water management strategies are implemented.

Some water quality managers see the current clamor over storm water regulation as a replay of initial reactions to fledgling point source controls two decades ago. These optimists emphasize the importance of a long-term perspective. Great difficulties were predicted for point source regulation, and some even considered Clean Water Act implementation unworkable or of questionable value. They believe there is little doubt today that point source controls were a worthy investment. The challenge at this stage is to convince local elected officials, business owners, developers and individual citizens that they all have a role to play in pursuing pollution-free water.

Despite the anxiety and confusion generated by EPA's storm water regulations, the greater challenge in coming years will be the control of truly diffuse nonpoint source pollution that is *not* captured by drainage systems. The storm water program should be a significant first step toward learning how to address these dispersed pollution sources.

Action Recommendations

Action: *Local storm water management programs that receive approval under the NPDES program should be required to develop advanced pollution prevention measures and practices in the vicinity of environmentally sensitive areas such as the Armand Bayou Coastal Preserve.*

- Involved Agencies:
- U.S. Environmental Protection Agency
 - Texas Water Commission
 - Harris County
 - City of Houston
 - City of Pasadena
 - City of Deer Park
 - City of La Porte

Rationale: The overriding purpose of the NPDES program is to improve the quality of urban storm water that is discharged from point sources. Discharges into critical segments, such as those identified as worthy of special protection through the Texas Coastal Preserve program, should receive even closer scrutiny. It is essential that local agencies which are responsible for developing and administering storm water management programs be made aware of Armand Bayou's preserve status. These agencies should work with preserve managers to determine where extraordinary pollution control measures are warranted in the vicinity of the bayou and its tributaries. If stream segments in Coastal Preserves are to be protected by the highest possible water quality standards, then presumably these areas will require the most innovative and effective pollution prevention methods.

Action: *Local storm water management plans affecting the Armand Bayou Coastal Preserve should include provisions for long-term monitoring of management practices and pollution prevention techniques.*

- Involved Agencies:
- U.S. Environmental Protection Agency
 - Texas Water Commission
 - Harris County
 - City of Houston
 - City of Pasadena
 - City of Deer Park
 - City of La Porte

Rationale: The same point has been emphasized for agricultural Best Management Practices, wetlands mitigation, and other environmental protection strategies: long-term field monitoring and evaluation is crucial to insure that pollution prevention strategies have been effective. If their effectiveness diminishes over time, then the protection measures must be flexible so that they can be adjusted in light of changing circumstances. Monitoring also should be used to document successes and communicate proven pollution prevention techniques through conferences and water quality publications. It also would be

helpful to be able to measure the contribution of various prevention methods to the attainment of water quality objectives.

Action: *The management agencies should use the Armand Bayou Coastal Preserve as a "pilot" area for the testing of storm water management practices and techniques.*

Involved Agencies:

- Texas Parks and Wildlife Department
- U.S. Environmental Protection Agency
- Harris County
- City of Houston
- City of Pasadena
- City of Deer Park
- City of La Porte
- Houston-Galveston Area Council
- Armand Bayou Nature Center

Rationale: Through this effectiveness study and other projects, Armand Bayou has been used as a model for eventual Bay-wide management planning. The Bayou also serves as a valuable tool for environmental education, primarily through the work of the Armand Bayou Nature Center. As emphasized elsewhere, the preserve area can continue to function as a "proving ground" for environmental protection strategies. For example, Best Management Practices for the control of nonpoint source pollution might be developed and tested here before they are implemented elsewhere. Other innovative techniques, such as filtering of effluent through existing or constructed wetlands, also might be evaluated in the preserve. In this way, the Coastal Preserve program can contribute to broader environmental enhancement rather than benefitting only the limited area within each preserve.

Action: *Preserve managers should determine nonpoint source data needs in the Armand Bayou Coastal Preserve and strategies for obtaining that data.*

Involved Agencies:

- Texas Parks and Wildlife Department
- Texas Water Commission
- U.S. Environmental Protection Agency

Rationale: Various reports have documented the need for an intensive study of Armand Bayou's stream segments. The *Environmental Inventory of the Armand Bayou Coastal Preserve* called for an investigation of toxics in the area's water and sediment. The *Inventory* also offered the specific recommendation that an additional monitoring station be added to the segments and that

monthly sampling be conducted for 2-3 years to establish a useful baseline of water quality information for the bayou (although EPA staff warn that prompt action to prevent water quality decline should not be postponed in the interim). EPA staff note that a logical next step would be to conduct a wasteload study that results in a reliable Total Maximum Daily Load calculation for the bayou. However, they emphasize that this would require a commitment of funds and an agreement between TWC and EPA on such a study through the usual water quality management planning process. In the meantime, preserve managers should work with water quality and habitat protection agencies to establish clear objectives for monitoring and data collection at Armand Bayou.

**Armand Bayou Management Framework:
STORM WATER RUNOFF**

AGENCY	AUTHORITY	POLICY	STRATEGY	ACTORS
EPA	<ol style="list-style-type: none"> 1. Water Quality Act of 1987 2. Clean Water Act 	<ol style="list-style-type: none"> 1. U.S. Congress: <ul style="list-style-type: none"> - statement of national goals and policy in Clean Water Act 2. EPA Administrator: <ul style="list-style-type: none"> - Code of Federal Regulations - Guidance documents 3. Regional Administrator, Region 6 	<ol style="list-style-type: none"> 1. NPDES storm water permits for separate storm sewer systems, discharges "associated with industrial activity," and other targeted storm water discharges: <ul style="list-style-type: none"> - evaluation of local storm water management programs 2. Development of general permits for lowest-priority discharges 3. Pre-application meetings with NPDES applicants 4. Outreach efforts: <ul style="list-style-type: none"> - informational seminars, staff presentations and workshops - technical assistance - guidance materials 5. Identification of a single representative by both EPA and the applicant to facilitate the permitting process 6. Required reports on the nature and extent of the storm water problem and local government management options 7. <u>National Water Quality Inventory</u> 	<ol style="list-style-type: none"> 1. Permits Division (Washington, D.C.) 2. Water Management Division (Dallas): <ul style="list-style-type: none"> - Storm Water Unit

**Armand Bayou Management Framework:
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AGENCY	AUTHORITY	POLICY	STRATEGY	ACTORS
TWC	1. Texas Water Code, Chapter 26	1. Texas Water Code: - statement of public policy 2. Texas Water Commission: - TWC rules in Texas Administrative Code - State Surface Water Quality Standards 3. TWC Executive Director 4. TWC guidance documents	1. Eventual assumption of NPDES storm water permitting authority from EPA 2. Incorporation of storm water management requirements in point source discharge permits 3. <u>Nonpoint Source Water Pollution Assessment Report for the State of Texas</u> 4. <u>Nonpoint Source Water Pollution Control for the State of Texas: Recommendations for the Future</u> 5. Municipal Water Pollution Control and Abatement Program: - storm water & nonpoint source management components 6. State Surface Water Quality Standards 7. Statewide Water Quality Monitoring Network: - biennial <u>Texas Water Quality Inventory</u> 8. Nonpoint source studies and field research	1. Executive Director 2. Water Quality Division: - Water Quality Standards and Evaluation Section 3. Field Operations Division: - District 7 Office (Houston) 4. TWC Analytical Laboratory (Houston) 5. Nonpoint Source Advisory Committee

Management Concern: STORM WATER RUNOFF

Background

Nonpoint source pollution is often described as the great remaining challenge for federal and state water quality agencies. The point source regulatory programs mandated by the Clean Water Act and other environmental legislation have substantially improved wastewater treatment in the United States and reduced the impacts of effluent discharges. But diffuse sources of pollution continue to impair water quality. Through the federal Water Quality Act of 1987, Congress formally recognized what many studies had established: most contaminated urban runoff eventually is captured by storm sewer systems and is discharged from point source outfalls. So Congress required that storm sewer discharges be treated like other point sources of pollution under the Clean Water Act's successful National Pollutant Discharge Elimination System (NPDES).

While regulation of storm water quality will not address all forms of nonpoint source pollution, it will target a number of crucial pollutants that reach receiving waters via storm sewers. These pollutants include oil and grease from roads and parking lots, pesticides and fertilizers from lawns, de-icing salts and chemicals from roads and airports, sediments from construction sites and resource extraction, as well as industrial wastes and materials, heavy metals, fecal coliforms, suspended solids, nutrients, floatables, grass clippings and leaves, litter and debris, and runoff from landfills, junkyards, spills and improper waste disposal. Another key concern is illicit connections to the storm sewer system that allow untreated sewage and other wastes to flow directly to water bodies. The U.S. Environmental Protection Agency advises that "removal of non-storm water discharges to storm sewers presents opportunities for dramatic improvements in the quality of storm water discharges."

Nature of the Problem at Armand Bayou

EPA headquarters staff have described Houston and Harris County as perhaps the most challenging storm water management scenario in the United States. Many of the factors that led to this conclusion also are evident in the Armand Bayou watershed. For example, the 60-square-mile watershed receives 48 inches of average annual rainfall, and storm intensities can vary greatly over time and between places. Heavy downpour events and more routine rainfall contribute to the estimated 80,000 acre-feet of annual freshwater inflow to Clear Lake from the watershed. There are numerous creeks and drainage ditches in the area that can carry pollutants to Armand Bayou, Clear Lake and beyond. But it is estimated that 1.8 million gallons of storm water was discharged from *point sources* in the watershed in 1989 (*Environmental Inventory of the Armand Bayou Coastal Preserve*, McFarlane and Shead). Most of the watershed is within the city limits of four cities: Houston, Pasadena, La Porte and Deer Park. It also contains three operating Municipal Utility Districts. Although the watershed's flat terrain is not fully

developed, 38% is devoted to residential and commercial uses and 6% to industrial uses. Ongoing development and the spread of impervious cover have altered the delivery of storm water to the Bayou from the surrounding area. Concerns about polluted storm water already have affected development planning in the watershed, such as the use of detention basins to reduce pollutant loadings. These are an important tool for management of storm water quality since most other flood control improvements are designed to increase the speed and volume of storm water that can be moved downstream, allowing less time for infiltration and settling and removal of pollutants.

Previous studies have noted that Armand Bayou water quality remains poor despite advanced regulation of point source dischargers. The bayou already receives more than 6 million gallons of treated effluent each day, and increased volume is expected. The watershed also contains a diversity of land uses, including golf courses, oil and gas development, two airports, and other uses that are considered prime sources of storm water contaminants. As a result, Armand Bayou presents much more of an *urban* scenario for water quality management than will be true of most other Texas Coastal Preserves.

Key Management Agencies

U.S. Environmental Protection Agency (EPA)

Prior to the Water Quality Act of 1987, the only significant federal provision for addressing nonpoint source pollution was the Section 208 areawide planning requirement of the Clean Water Act. States were expected to take a lead role on nonpoint source matters through their water quality management functions. EPA originally exempted storm sewer discharges from the NPDES permitting program, but a court order forced EPA to address them. EPA then proposed a general permit approach. No major progress was made before Congress clarified federal storm water regulation with the Water Quality Act. The Act states that "it is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution." Section 405 of the Water Quality Act establishes a tiered approach to storm water permitting. The first permits will be required for:

- discharges already subject to a permit
- discharges from separate municipal storm sewers serving a population of 100,000 or more
- discharges "associated with industrial activity," or
- any discharge that EPA determines to be contributing to a violation of state surface water quality standards or which is a significant contributor of pollutants to waters of the United States

The new NPDES permitting provisions apply only to those discharges composed *entirely* of storm water. In the storm sewer system category, for example, only separate storm sewer systems are covered, and not combined sanitary and storm sewer systems (which presumably hook into a treatment facility). Other types of point source discharges already are covered by the NPDES program. This first tier of storm water dischargers must receive NPDES permits by October 1, 1992, and they must be in full compliance within three years.

EPA's final rule on storm water permitting, published in the *Federal Register* on November 16, 1990, established a two-phase application process for separate storm sewer systems. The associated application deadlines differ based on the system's size classification. "Large" storm sewer systems are those that serve 250,000 or more persons. "Medium" systems serve at least 100,000 and less than 250,000. (All remaining "small" storm sewer systems must seek permits after the October 1992 deadline, but EPA has not yet issued application instructions or deadlines for smaller municipalities or system operators.) Part I requires information on the discharger's existing storm water management efforts and the means available for controlling pollutants in storm water discharges. The first stage also requires that managers of storm sewer systems perform field screening of major outfalls to detect illicit connections. EPA classifies storm water outfalls based on their diameter and the size of the area they drain. Applicants probably will be expected to analyze local drainage areas and document population and land use trends in each. "Large" systems must submit their Part I applications by November 18, 1991 (one year after publication of EPA's final rule), while applications for "medium" systems are due by May 18, 1992 (18 months after publication). In Part II, the applicant must collect a limited amount of representative system data and propose a comprehensive storm water management program. The applicant also must demonstrate adequate financial and administrative capability to implement the management program. "Large" systems must complete Part II by November 16, 1992 (two years after publication), while "medium" systems have until May 17, 1993 (30 months after publication). Those elements of the proposed management program that EPA considers essential to pollution abatement will become conditions of the eventual NPDES permit. EPA encourages permittees to go beyond the minimum federal requirements included in the permit and implement the most ambitious pollution prevention strategy that they can support.

In addition to the urban storm sewer systems described above, EPA's permitting rules also apply to certain enterprises that generate storm water "associated with industrial activity." This terminology may seem convoluted, but it is needed since not only private industry, but also public agencies, may be involved in activities that can be classified as "industrial" (e.g., public airports, solid waste collection and disposal, etc.). EPA explains that its "industrial activity" permit requirements are aimed at those discharges "from any conveyance that is used for collecting and conveying storm water, and which is directly related to manufacturing, processing, or raw materials storage areas at industrial plants." EPA estimates that about 100,000 facilities nationwide are affected by this part of the storm water regulations. Such activities that can affect storm water quality may be discharging into a local storm sewer system or directly into waters of the United States. Those that discharge into a large or medium system must notify the system operator of

certain basic information concerning their operations. What is significant about this portion of the regulations is that *any* municipality or government agency -- not just those serving more than 100,000 persons -- may be required to obtain a permit for its "industrial activity" discharges before the October 1992 deadline. The regulations specify the types of activities, based on Standard Industrial Classification (SIC) code, that EPA considers to be associated with "industrial" activity. Specific examples of these include:

- hazardous waste treatment, storage or disposal facilities
- landfills, land application sites, and open dumps that receive industrial wastes
- certain recycling facilities
- the following transportation facilities: vehicle maintenance, equipment cleaning, or airport de-icing areas of railroad, mass transit, school bus, trucking and courier services, postal service, water transportation, and airport facilities
- sewage treatment plants treating domestic sewage, or any other sewage sludge or wastewater treatment device or system, used in the storage, treatment, recycling, and reclamation of sewage (including land used for the disposal of sludge located within the confines of the facility) with a design flow of 1.0 MGD or more or required to have an approved pretreatment program
- certain warehousing and storage establishments where materials are exposed to storm water

It may not always be clear whether a public sector activity falls under one of the identified SIC categories, but EPA leaves it to the involved government agency to make the SIC determination. EPA points out that portions of sites that are separate from the "industrial" activity, such as office buildings and accompanying parking lots, are generally not considered part of the industrial activity for permitting purposes unless the drainage from that area somehow mixes with the "industrial" runoff.

The storm water regulations provide three application options for discharges associated with industrial activity. The first and most demanding is the individual permit application. For administrative reasons, EPA hopes that as many applicants as possible will link up with similar dischargers in their area and submit group applications. It is not yet clear whether groups who pursue this second option will receive some form of a shared permit or whether each group member will receive an individual permit. It probably will depend on the characteristics of each group. The final option is the simplest since applicants must merely file a brief Notice of Intent that they wish to be covered by a general permit for storm water discharges. However, this option may involve the most risk because EPA's proposed general permit is still being reviewed

internally as well as by the Office of Management and Budget (OMB). If a general permit is not approved by the October 1992 deadline, NPDES applicants may be forced to submit an individual or group application.

The initial application deadlines for "industrial activity" permits were recently extended six months by EPA's Administrator. Concerns had been raised about the number of applicants scrambling to meet the EPA timetable, especially in light of the changes made from the 1988 proposed rule. Individual applications now are due May 18, 1992, instead of November 18, 1991 (one year after publication of EPA's final rule). The deadline for Part I of group applications was moved back from March 18 (four months after publication) to September 30, 1991. Part II of group applications still will be due in May 1992. (Any facility that is rejected by EPA as a group participant will have one year to re-apply as an individual applicant.) The deadline for group applications is still eight months earlier than for individual applications. But the incentive to meet this tighter schedule is that group application requirements are less onerous for each participant compared to filing individually. If EPA receives approval for its general permit, it will at that time establish a date by which Notices of Intent (to be covered by the general permit) must be submitted. Dischargers who seek coverage under the general permit are not required to submit an individual or group application, although, as mentioned above, there is some risk involved in case the general permit is delayed indefinitely.

EPA is still formulating its strategy for issuing permits to "industrial" dischargers once their applications are processed. It hopes to establish a tiered approach that will allow it to issue general permits to facilities of least concern and concentrate on specific permits for the highest-priority dischargers. Under this approach, EPA would proceed from "baseline" permitting for the majority of dischargers to watershed permitting, then to industry-specific permitting, and finally to facility-specific permitting. EPA's regulations outline "generally applicable requirements" for all industrial activity permits and then provide specific requirements for particular activities, such as construction, mining, and oil and gas operations. These permits will rely first on technology-based controls and then, if necessary, on water quality-based controls.

EPA Region 6 personnel administer the agency's water quality and point source programs in Texas and also will oversee NPDES permitting for storm water discharges. A Regional Administrator manages Region 6 operations in Dallas. He is one of 10 regional administrators who report to the agency's Administrator, based at EPA headquarter in Washington, D.C. The Administrator of EPA and a Deputy Administrator are appointed by the President with the advice and consent of the U.S. Senate. EPA Region 6 covers Texas, Louisiana, Arkansas, Oklahoma and New Mexico. As it does in point source regulation, EPA's Water Management Division will play the lead role in storm water permitting. One of the division's chief functions is to advise the Regional Administrator on appropriate goals, objectives and priorities for regional water quality management. The division's Permits Branch has established a 4-person Storm Water Unit to administer the new NPDES permitting program. EPA's Permits Division in Washington, D.C., is responsible for implementing the stormwater program nationwide. Region 6 storm water staff will specialize in municipal or industrial permitting, just as their point source

colleagues do. In addition, each staff member will establish contacts with particular cities and industries. One person has been assigned to coordinate the Houston/Harris County application process. Region 6 has requested that every affected city designate one staff member as a liaison to EPA on the storm water program. The staff hope to arrange a pre-application meeting with every NPDES applicant. The staff also have been involved in intensive outreach efforts, including workshops, informational seminars and staff presentations at various events. EPA also hopes to work with the Texas Water Commission to sponsor additional seminars in the state, although all of these efforts are limited by agency travel and staff budgets. EPA headquarters staff plan to supplement these regional outreach efforts with nationwide guidance documents for staff and applicants.

The federal storm water rules published to date focus more on the mechanics of applying for an NPDES storm water permit and not as much on what will be required of a permittee. However, it is known that system operators and other dischargers must develop a comprehensive management strategy for reducing pollutant levels in discharged storm water. The purpose of the phased application timetable is to give dischargers sufficient time to develop appropriate local methods for cleansing storm water. EPA will issue or deny NPDES permits based on its assessment of the storm water management program proposed by each applicant. The permittee then will have an initial period to implement and test the approved management strategies.

EPA does not consider the regulations a traditional "end of pipe" approach because the quality of the discharge will only be used as an indicator of the permittee's success in storm water management. The emphasis is on the pollution prevention strategies themselves. Dischargers must demonstrate that they have identified and targeted the most serious sources of storm water contamination. The regulations require that each storm sewer system reduce pollution to the "Maximum Extent Practicable" (MEP). While EPA provides no clear definition of this standard, it is understood that cities and other storm water dischargers must make every reasonable effort to minimize pollutant content and insure that their outfalls do not cause a deterioration in the water quality of receiving streams. EPA wants a results-oriented program, and it will leave it up to each permittee to suggest the best method for achieving MEP results -- "to write their own permit," as some EPA staff like to say. The general guidance that EPA has provided refers to "management practices, control techniques, and system, design and engineering methods and other provisions appropriate for the control of such pollutants." EPA has considerable flexibility to shape local management programs as it sees fit to achieve water pollution abatement objectives. EPA will use the results of outfall monitoring to re-evaluate local storm water programs and revise issued permits when they come up for renewal. But some local governments continue to worry that EPA eventually will mandate treatment of storm water in the worst cases and that this effectively will turn the program into an end-of-pipe regulation. EPA understands these concerns but responds that permittees have the opportunity to avoid treatment requirements by doing as much as they can to minimize pollutants before they reach the storm sewer system.

The rationale behind the regulations is that there are various activities on land that can indirectly affect nearby water bodies, and rainfall is the vehicle that transfers those impacts to receiving waters. When that rainfall is collected and conveyed to point source outfalls by an urban storm sewer system, then the sewer system becomes a more manageable focus of regulation since it concentrates and carries pollutants toward identifiable discharge points. The regulations are designed to motivate sewer system operators to identify and control those sources of pollution that introduce the most serious pollutants into "managed" urban storm water. These pollutants can enter the system directly through illicit connections or illegal disposal or indirectly through dispersed urban runoff that enters the system through catch basins and infiltration. The challenge for storm water managers, aside from eliminating illicit connections, is how to identify and best regulate those highest-risk, dispersed sources of contaminated runoff.

In addition to illicit connections, EPA's priorities under the storm water program include:

- strict controls on certain perennial sources, such as household hazardous waste dumped into storm drains
- control of pesticides (especially those that persist through treatment and still show up in downstream waters) and prevention of improper applications by highway departments, parks and recreation staff, commercial lawncare firms, and homeowners
- sediment and erosion controls, during and after construction
- other forms of runoff control, as needed, for industrial, commercial and residential areas

Local governments in Harris County that are affected by the initial storm water regulations have organized a task force of key staff to consult with EPA, identify common management problems and concerns, and possibly develop a group application for Harris County's major storm water discharges. The task force includes representatives of Harris County, the City of Houston, and the City of Pasadena. Houston and Harris County both must meet the earlier deadlines for "large" systems, so Pasadena, as a "medium" system, may decide to go its own way. The participants are still not certain whether they will end up sharing a discharge permit or will be permitted individually by EPA. However, the task force members are attempting to learn as much as they can about EPA's requirements so that they may report back to their respective superiors and elected officials on how to proceed. The City of Houston intends to employ consultants to assist with the technical work required for the NPDES application. Another function of the task force is to coordinate with any other "enclave cities" or "inter-related" dischargers that EPA considers to be part of the overall storm sewer "system" in the county.

Details on EPA's plans for monitoring and enforcement of storm water permits are not yet known, though they are likely to be patterned after the agency's existing NPDES

strategy for traditional point source discharges. This probably will include some degree of self-monitoring and reporting by permittees, periodic compliance inspections, and the usual in-stream monitoring of water quality performed principally by the Texas Water Commission, with targeted monitoring by EPA. EPA will focus on enforcing the requirements of its NPDES permits, while the permittees themselves will be expected to enforce their own local rules and pollution prevention standards that are the basis of their approved storm water management program.

Finally, the Water Quality Act of 1987 required that EPA prepare two reports on storm water issues. One report will examine the nature and extent of storm water pollutants, and the other will explore local government options for managing storm water quality. EPA headquarters staff plan to complete these reports by the end of 1992. It is expected that application requirements for all remaining storm sewer systems will be promulgated after these reports are completed.

Texas Water Commission (TWC)

Although the Texas Water Commission has not had an established, comprehensive mechanism for addressing discharges of polluted storm water, TWC's permitting staff have frequently made improved storm water management a condition of routine permits for point source discharges. This is most often the case with industrial dischargers. TWC will have to prepare for more formal regulation of storm water discharges in Texas when it assumes NPDES permitting responsibility from EPA. TWC officials have indicated that, like EPA, they hope to issue general permits to the majority of dischargers so that they can concentrate on those that are causing the greatest water pollution problems.

Both TWC and the Texas Soil and Water Conservation Board are authorized by the Texas Water Code to develop regulations aimed at reducing nonpoint source pollution. Rather than a regulatory approach, however, both agencies have focused more on management planning, public education, and promotion of Best Management Practices. Cooperation between the agencies on nonpoint source issues reached a peak over the last few years as they responded to the federal mandates contained in the Water Quality Act of 1987. The Act required each state to prepare a nonpoint source assessment report and a statewide management program. TWC coordinated the input of various state and local agencies in preparing these reports while the Soil and Water Conservation Board examined the nonpoint source impacts of agriculture and silviculture. Neither of the Armand Bayou stream segments was identified in the state assessment report as being significantly impacted by nonpoint source pollution. TWC's Nonpoint Source Advisory Committee drafted and ranked fourteen strategies for improving management of nonpoint source pollution in the state. The recommendations fell under three general categories: education, best management practices, and monitoring and data. The committee estimated that the entire package would cost \$3.5 million in the first year of implementation and \$1.5 million in each successive year.

Until NPDES delegation occurs, TWC's Municipal Water Pollution Control and Abatement Program offers the best opportunity for Texas state government to become involved in storm water pollution control. The program is designed to guide local governments (those serving at least 5,000 residents) as they develop comprehensive strategies for addressing the entire range of activities in their jurisdiction that have the potential to cause ground or surface water pollution -- whether from point or nonpoint sources. The program, when implemented, will affect all four cities in the Armand Bayou watershed: Houston, Pasadena, La Porte and Deer Park. A bill passed in the late 1960s (Senate Bill 835) first called for a Municipal Water Pollution Control and Abatement Program in Texas. But this bill produced little action because it had no provisions for state agency guidance or review of local plans. House Bill 1546, passed in 1989, clarified the program's requirements and the authority of the Texas Water Commission to implement it and approve local plans. However, the program remains on hold while TWC determines how to proceed. One stumbling block is how to finance the program. Many cities opposed TWC's proposal that municipalities collect fees and return 5% of that revenue to the state to cover administrative costs. EPA is supportive of the program because it will mesh nicely with EPA's vision of state and local leadership in storm water management and nonpoint source pollution abatement. One existing example of this in the Houston area is a nonpoint source "solutions and alternatives" report prepared by Clean Houston's Clean Bayou Task Force at the request of Mayor Kathryn Whitmire.

TWC policy, implementing rules, and regulatory decisions are made by the three-member Texas Water Commission. The Commissioners are appointed for six-year terms by the Governor with the advice and consent of the Texas Senate. Point source regulatory efforts and nonpoint source management are the responsibility of TWC's Water Quality Division, which is one of six regulatory divisions within TWC that report to the agency's Executive Director. The Division's Water Quality Standards and Evaluation Section oversees the development of state water quality standards and supervises the state water quality monitoring network. These key state-level functions provide the framework for setting storm water management objectives and monitoring the progress of nonpoint source control efforts. It is not yet known how TWC might change or expand its existing Permits and Enforcement Sections to administer the NPDES storm water permit program following delegation from EPA. The Pollution Abatement Unit will oversee the eventual implementation of the Municipal Water Pollution Control and Abatement Program. TWC's Field Operations Division supports existing point source permitting and monitoring through its network of 15 District offices across the state. The District 7 Office is based in Houston, as is the TWC analytical laboratory. TWC is currently expanding its laboratory capacity and moving the facility into the same building that houses the District 7 Office. This will allow closer contact between lab personnel and field staff to coordinate routine work, special studies and field methods.

TWC field staff point out that if more extensive treatment of industrial storm water is required as a result of EPA's new NPDES permits, then the Gulf Coast Waste Disposal Authority will be the logical entity to perform this service in the Armand Bayou

watershed. They note, however, that even the Authority cannot handle excessive storm water volumes during periods of extreme wet weather. In anticipation of upcoming storm water management programs, the field staff also are studying golf courses as a potential source of excessive nutrient loadings from fertilizer and herbicide use. This is a particular concern in the vicinity of Armand Bayou because of a handful of new and existing courses in the area.

Management Evaluation Findings

1. *The existing water quality management framework is focused primarily on point source regulation, so the involved agencies are still adjusting to a new, expanded, and more complex management role.*

Environmental advocates believe that effective prevention of storm water contamination will require regulation -- or at least guidance -- of a multitude of dispersed activities not normally "managed" by water quality agencies. A similar example that was mentioned is air quality management in southern California, where state and local agencies have had to adopt "micro-management" techniques, including regulating such mundane activities as backyard barbeque grills, to achieve regional air quality objectives. Both Congress and EPA officials know that advanced stages of pollution abatement will require changes in long-standing social habits and behavioral norms. Attempts to influence "polluting behavior" are likely to be controversial because they will cause conflicts with economic and individual preferences. But water quality managers emphasize that dispersed, individual contributions to pollution, when considered cumulatively, are the most critical remaining source of water degradation. Extensive public education will be needed to raise awareness of the problem and focus attention on the options for improving storm water quality. TWC's Nonpoint Source Advisory Committee suggested using the highly successful "Don't Mess With Texas" anti-littering campaign as a model for nonpoint source education. In Houston, TWC field staff point to the bayou system as a valuable educational tool: after each substantial rainfall, trash and debris are visible in every bayou, especially along the banks and in the overhanging trees as the water recedes. These types of educational efforts will be especially crucial if "pollution prevention" is to be achieved and costly, "after-the-fact" storm water treatment avoided.

In many ways, this is still unfamiliar ground for water quality agencies such as the Texas Water Commission. That is why agency managers sometimes are sensitive about how to proceed on storm water management. They are not sure that an "end of pipe" regulatory approach would be any more welcome, but they feel that they will be walking a fine line in pollution prevention, almost to the point of telling individuals what they can and cannot do. They want to minimize any feeling that they are dictating to the public or going too far with their regulations. Some observers have pointed out that this might be an easier job for a general

environmental agency, one that could emphasize the entire range of unacceptable human impacts on the environment that must be brought under control.

An important feature of EPA's storm water permitting program is that it is designed to allow time for these types of management adjustments, although some critics would contend that it is not enough. The application process is phased to allow time for local policy and strategy development. The regulations then call for three years of experimentation and evaluation before local storm water management programs must achieve full compliance with their NPDES permits.

2. *The greatest concern surrounding the NPDES storm water program is whether the management agencies are prepared for the administrative burden they will face.*

The storm water program is considered a major challenge for all levels of government, especially local governments, at a time when they are facing a variety of other management dilemmas and urban crises. EPA officials know that their own agency will have to manage a huge volume of NPDES applications, especially for public and private discharges "associated with industrial activity." In anticipation of this administrative burden, EPA is emphasizing group applications and general permits over individual approaches. EPA hopes to keep the storm water regulatory process as simple as possible, and cost-effectiveness will be one of the key criteria when local management strategies must be selected during the permit-writing phase.

Concerns continue to be expressed about inadequate staff and funding at both EPA and the Texas Water Commission to handle their storm water mandates. EPA Region 6 has formed a new Storm Water Unit, but many observers doubt that a four-person staff will be sufficient for the task. Referring to the Management Framework table, EPA staff made the following assessment of their own agency's ability to implement various aspects of the program:

- The goal of permitting separate storm sewer systems is "manageable" with available resources.
- The goal of permitting discharges associated with industrial activity can only be achieved using the "baseline" general permit due to the number of facilities involved.
- The goal of evaluating local storm water management programs -- and of developing general permits for the lowest-priority discharges -- is "severely constrained" by available agency resources. According to EPA staff, "essentially there are no resources to do these. The situation is similar to EPA's current low priorities on minors." Under the circumstances, EPA can only afford to evaluate local storm water management programs for cities with populations of 100,000 persons or more.

- The goal of sponsoring such outreach efforts as seminars, presentations, workshops, technical assistance and guidance materials is also "severely constrained." EPA reports that there are no funds or positions available to provide this support.

Staffing levels at TWC for eventual NPDES permitting are not yet known, but judging from current state budget constraints, there is concern that TWC also will be unable to devote adequate resources to storm water permitting and management. TWC managers agree that there has long been a need for greater equity in water quality regulation. So much of the regulatory burden has been on point sources of pollution while nonpoint source contributions have continued. But TWC officials say that it is important to strike a point/nonpoint balance now and avoid going too far the other way and neglecting successful point source programs.

EPA officials recognize that state and local governments are facing a typical dilemma: a congressional mandate without funds for implementation. These officials emphasize that the key for local governments is to minimize their costs by focusing on pollution prevention to avoid the need for treatment. Traditional "end of pipe" treatment is too costly since it requires extensive capital investment and intensive treatment processes. Alternative "treatment" strategies should be attempted first, provided that they are even necessary after the key early abatement steps -- such as elimination of illicit connections -- have been taken. These alternative approaches primarily involve the incorporation of pollution control measures into existing flood control facilities. This might include strategic placement of appropriate pollution-filtering vegetation, utilization of existing or constructed wetlands, or construction of detention basins (i.e., backing water up in certain parts of the drainage system to allow pollutants to settle or be removed by some technique). EPA advises that the first step is to ask how much treatment is actually needed in flood control bottoms? Then, what are the best techniques for removing toxics, metals, organics, and other targeted pollutants? These pollution prevention measures should interfere only marginally with flood control objectives. The key for the future is to include these prevention capabilities in all new flood control facilities. EPA staff suggest linking flood control facilities with public parks to create "greenbelt" areas that will cleanse storm water during wet weather and provide public open space the rest of the time. However, one practical problem that must be resolved is the question of who will assume responsibility for the operation and maintenance of storm water detention basins once they are constructed?

While EPA appreciates the position of cities, it also wants cities to recognize that they are the major water pollution sources, despite the popular belief that industry is the chief culprit. EPA officials say that many urban areas in the United States are not treating their waste adequately, and runoff from various urban activities compounds chronic water pollution. EPA is proceeding with a "whatever it takes" approach under the NPDES storm water program. Cities are urged to explore all options for pollution prevention. They must take stock of all urban activities that

unreasonably impact the environment. As for industries, both public and private, Congress declared that they should "treat" their own storm water before discharging it to the municipal system or the receiving stream. The end goal of all dischargers should be the delivery of clean storm water to receiving streams so that water quality standards can be achieved. Nothing has changed as far as what is expected of EPA and all other government agencies and citizens under the Clean Water Act. What is new, or at least is being emphasized more forcefully than ever under the current Administrator, is that environmental regulation should reflect a weighing of risks, a setting of priorities, an intelligent allocation of resources, and a constant concern for effectiveness and meaningful results.

EPA has little sympathy for local governments that either do not appreciate the impacts of pollution generated in urban areas or are not moving to reduce those impacts. Region 6 officials emphasize that many of the pollution problems of Galveston Bay and other coastal areas can be traced to upstream, urban sources. In all areas of regulation, EPA is attempting to "internalize" the costs of pollution and regulation. The difficulty of the urban storm water program is that it is the polluting behavior of countless individuals -- "people pollution" -- that is the problem. EPA is placing the burden on cities, which in turn must find ways to discourage their residents and businesses from polluting. This will require extensive public education and "non-structural" methods.

EPA staff admit that their agency is looking for a complete cultural change in many urban areas, not only on storm water issues, but on the overall treatment of the environment, whether it involves waste minimization, reduced energy use, or other behavioral changes. They are relying on the promise of technology, noting that numerous pollution prevention options already exist. It is mainly a matter of raising awareness of the need for these techniques and the alternatives that are available. EPA urges cities and others to take advantage of its in-house expertise and technical assistance capabilities.

3. *The complexity of the NPDES storm water program is being compounded by the degree of uncertainty surrounding various aspects of the program.*

What most concerns cities, counties and other potential applicants is that they are not certain what will pass muster for an NPDES storm water permit. They seem to be frustrated even more by what they perceive as a lack of sufficient answers from EPA on how to proceed. There also is disagreement over the expected cost impacts of the NPDES application process, as well as the costs of implementing local management programs. Some observers have raised the prospect of a storm water fee on homeowners and commercial property, speculating that it might be based on the amount of impervious cover on a parcel.

EPA staff have attempted to reassure applicants that the NPDES application requirements, while complicated, are not meant to be draconian or inflexible. EPA expects municipalities and other applicants to make their best reasonable effort at

following the permit application rules. Then EPA will negotiate with each applicant concerning the completeness and adequacy of its proposed storm water management and pollution abatement strategy. The bottom line is that the applicant must show an appreciation of the regulation's basic purpose: identification and control of sources of storm water pollution. At a minimum, this must include:

- disconnecting illicit discharges to remove raw sewage from the storm sewer system
- reducing industrial pollution in the storm sewer system
- if discharge quality is still unacceptable, implementing controls on additional sources of contamination (these will vary depending on the jurisdiction and the nature of its pollution problem, but it is possible that regulation of the use of certain pesticides and lawn fertilizers will be a starting point in many places)

The applicant must demonstrate good faith efforts to comply with the application requirements. For example, EPA staff have pointed out that when the regulations call for the selection of 5-10 representative sampling points, the applicant should propose no fewer than 10 since EPA and the applicant will have to agree on the 5-10 best locations for eventual sampling.

EPA staff say that too many cities are being distracted by the notion that the federal government is going to force them to adopt "socially disruptive regulations" and interfere with private activities that they never have had to address before. EPA believes that cities are ignoring the basic question: how do they want to pay to remove contaminants from storm water before it is discharged? They can choose prevention, or they can commit to traditional "end-of-process" treatment. EPA staff say that those cities that have looked at the "bottom line" understand the trade-offs involved. Pollution prevention programs, such as those expected under the storm water permitting program, admittedly have high up-front costs. But these costs must be compared to the long-term savings from reduced treatment requirements. EPA views it as a "pay now, or pay later" decision for cities.

There also has been some confusion among municipalities as to how enforcement will occur under the storm water program. There actually will be two layers of enforcement. Cities must enforce the requirements and standards of their local storm water management programs, such as erosion control rules for construction sites. EPA will focus on the performance of the permit holders -- the cities and other stormwater dischargers who are responsible for reducing pollutant levels in storm water. The Texas Water Commission will assume this enforcement responsibility upon delegation of NPDES authority to the state. As always, state and federal water quality agencies request the ongoing assistance of municipalities in helping them to identify permit violations and illegal pollutant discharges.

Unfortunately, many affected local governments still do not fully understand their options and responsibilities under the program. For example, some are concerned about their individual liability under a group application should one member of the group fail to perform as required. EPA has attempted to resolve these and many other questions through special workshops designed specifically for municipal applicants. Even EPA's storm water specialists admit that they have much to learn about how the new NPDES program will operate. One staff member who has been making almost daily presentations on the program says that at nearly every event he is confronted with questions and issues that even EPA has not yet considered. EPA staff emphasize that the NPDES storm water program is "not set in stone" and likely will evolve and be dynamic just like all of EPA's programs. The point to keep in mind, they say, is that the storm water program is another major step toward attaining the Clean Water Act's ambitious goals.

4. *There is concern that the management agencies do not have adequate data on nonpoint source pollution -- or on how certain activities contribute to runoff contamination -- to undertake effective regulation.*

Agency managers agree that if more money suddenly were available to them through the budgetary process, one of their first priorities would be the acquisition of much more extensive data on nonpoint source pollution. They see a definite need for better understanding of cause and effect and of the long-term and short-term impacts of contaminated storm water and dispersed runoff. The agencies seek any information that will help them to clarify nonpoint source pollution problems, craft more effective regulations, insure that the highest-priority issues are being addressed by the regulations, and determine whether regulations are even needed in certain cases or whether a more efficient use of resources is possible. Agency managers also know that their staff must be knowledgeable about local and regional pollution factors and variations between places. One manager emphasized that regulatory agencies should not automatically ban activities because they contribute to pollution. Instead, the agencies should study them, determine what specific aspects of an activity cause problems, and then regulate those particular elements. The same philosophy comes into play when discussing the difficulty of regulating land use in certain parts of the state. While EPA and TWC officials believe that traditional land use ordinances, such as zoning and subdivision controls, are an important storm water management option, they caution that they are only one of many options. The more important question is how important they are to local nonpoint source management strategies, given local circumstances and attitudes. Many agency staff believe that it is more important to emphasize a performance-based approach that focuses on the specific polluting impacts of land development. Examples of this approach include erosion and sediment controls during and after construction and the design and maintenance of landscaped on-site detention ponds for storm water. Some TWC staff conclude that it may be too late for traditional land use regulation to make much of a difference in an area that has undergone the degree of prior development that the Armand Bayou watershed has. Instead, they point to the need

for basic nonpoint source monitoring data and additional information on toxics and other priority pollutants in Armand Bayou.

5. *The Texas Water Commission's Municipal Water Pollution Control and Abatement Program is expected to bring important benefits in the area of nonpoint source pollution, but the agency still has not resolved what the program will require of Texas cities.*

TWC officials report that the proposed Abatement Program has had many demands placed on it by diverse groups who want to see it do many things. One manager theorizes that the program has attracted so much interest from environmental advocacy groups because it represents one of the first truly statewide, grass-roots environmental improvement programs in Texas. Unfortunately, they say there is much less enthusiasm to help TWC arrive at a funding method that will be workable and politically palatable.

TWC officials are aware of the growing pressures on cities, which are part of the "regulated community" under a number of mandated federal and state water quality programs. The Abatement Program is intended to continue the transition toward a "pollution prevention" emphasis in environmental management, as opposed to traditional "command and control" regulations. In line with EPA philosophy, the program will encourage rational problem identification, effective field assessment and data-gathering, development of risk-based management strategies, and continuous evaluation and refinement of management efforts. TWC officials agree that this is the best way to minimize the costs of environmental regulation and insure an optimal allocation of limited municipal and state agency resources.